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Totally Laparoscopic Combined Freehand Ileocystoplasty and Malone Procedures

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ABSTRACT

***Background and Purpose*: Cecostomy performed together with open enterocystoplasty can allow continent bowel evacuation in children with neurogenic dysfunction. We present the first report on a combined approach to fecal and urinary incontinence in children with myelomeningocele that was performed exclusively by freehand laparoscopy.**

***Patients and Method*: We treated six dysrhaphic patients for total urinary and fecal incontinence by laparoscopy. Through five ports, a selected segment of ileum was isolated with cautery. A single-layer intestinal anastomosis, fashioning of the U-shaped patch, and anastomosis to the opened bladder dome were all done by endocorporeal freehand suturing. The tip of the appendix was simply brought to the skin via a trocar site.**

***Results*: The procedures took 5 to 8.5 hours. Patients remained hospitalized for 5 to 16 days (median 5 days). At 13 to 16 months' follow-up, all patients remain continent of urine, and nearly perfect fecal continence has resulted on antegrade enema. Leak from the ileal anastomosis in one patient resolved rapidly with conservative management. One short retrocecal appendix later developed stenosis and was replaced by a tubed cecal flap.**

***Conclusion*: Apart from its cosmetic advantage, this procedure is notable for addressing all evacuation problems at one session. Our suturing time seems reasonable compared with open sutured precedents. Use of a gastrointestinal stapling device for anastomosis would have significantly increased the cost while not necessarily guaranteeing against complications. We present this laparoscopic combination as an effective alternative to its open counterpart.**

INTRODUCTION

APPENDICEAL CECOSTOMY can allow continent bowel evacuation in children with neurogenic bladder when performed together with open enterocystoplasty.[1] Gill and associates[2] reported on laparoscopic cystoplasty, handling the bowel extracorporeally. Purely laparoscopic ileocystoplasty aided by an endoscopic stapling device was reported by Meng and colleagues,[3] and a number of reports exist on laparoscopic creation of a continence enema port. Our case series to our knowledge represents the first report of a combined approach to fecal and urinary incontinence in children with dysrhaphism through exclusively freehand laparoscopy.

PATIENTS AND METHOD

Patients

Our study group included three female and three male children aged 9 to 14 among those referred to our center with total urinary and fecal incontinence secondary to myelomeningocele. Their symptoms had been refractory to medical management over a variable period of intermittent catheterization, anticholinergics, and conventional laxatives. Sonography had revealed relatively well-preserved upper tracts in each case. Some representative data on the preoperative status are shown in Table 1. Once scheduled for bladder augmentation on the basis of this

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Table 1. Representative Preoperative Findings

Patient	*Age (years)/sex*	*RFT*[a]	*Upper tracts*[a]	*Reflux*	*Functional bladder capacity (mL)*	*Max. detrusor pressure (cm H_2O)*	*Valsalva leak-point pressure (cm H_2O)*	*Anal sphincter tone*
1	10F	WNL	WNL	None	45	18	20	Absent
2	12F	WNL	WNL	None	50	55	52	Low
3	11M	WNL	RK WNL, LK scarred	None	73	24	27	Absent
4	11F	WNL	RK fullness, LK WNL	None	41	56	53	Low
5	9F	WNL	WNL	None	32	37	38	Absent
6	14M	WNL	WNL	None	47	21	21	Absent
Mean (range)					48 (32–73)	35 (18–56)	35 (20–53)	

[a]RFT = renal function tests; WNL = within normal limits; RK = right kidney; LK = left kidney.

background, the patients were offered the choice of open or laparoscopic cystoplasty and opted for the latter.

Description of technique

Having administered routine mechanical and chemical bowel preparation on the day before surgery, laparoscopy proceeded using one 12-mm umbilical port and two 5-mm ports on either side of the rectus muscle. An approximately 20-cm segment of ileum was chosen, preserving its terminal 15 cm. Mesenteric incisions were created by a combination of bipolar and monopolar cautery without clips or ligatures, as has been our common practice for open surgery for some time. A lightly tied ligature of heavy silk was placed temporarily at each end of the bowel leading to the chosen segment to prevent egress of its contents. The loop was first washed out by introducing the suction/irrigator through a small enterotomy and subsequently isolated using Endoshears. Intestinal anastomosis was done in a single layer of running 2-0 polyglactin suture, flipping the bowel to do the other side half way through. We reinforced the anastomosis with a second layer of silk Lembert in our first case alone.

We incised a particularly thick bladder dome in both the sagittal and coronal planes if necessary to accommodate the ileal patch. The detubularized bowel was used as a strip in our youngest patient. For the rest, we anchored the midpoint of the caudal edge of the strip to the dorsal apex of the cystotomy, running sutures of 2-0 polyglactin to either end. This formed the posterior half of our vesicoenteric anastomosis as if it were a simple patch. Picking up at the middle of the cephalad edge, we then approximated its two halves to yield the desired U shape. Finally, the anterior vesicoenteric anastomosis proceeded beginning in the middle and working laterally.

Freehand endocorporeal suturing was used exclusively, and we frequently found the simultaneous use of two needle holders to be helpful. In all but our first case, a punch suprapubic tube was introduced into the bladder under laparoscopic vision in addition to placing as large a urethral catheter (two-way silicone Foley) as was safely feasible.

Finally, the tip of the appendix was simply brought out through the lower-right trocar site in the manner described by Malone and spatulated and anastomosed to the skin, leaving an 8F stent in its lumen and two closed suction drains through the trocar sites. We did not imbricate or otherwise reinforce the appendix, nor was the cecum fixed to the abdominal wall.

Patients resumed oral fluid intake as soon as their bowel activity returned and were discharged on regular diet and continuous bladder drainage. Intermittent catheterization began once cystography proved no leak (within 3 weeks).

RESULTS

On average, the procedure took 326 minutes (range 5–8.5 hours), with an average of 88 minutes for bowel anastomosis, 145 minutes for vesicointestinal suturing, and a mere 12 minutes for creating the Malone port. The intraoperative blood loss was generally <170 mL.

At 13 to 16 months' follow-up, the aforementioned biophysical parameters have significantly improved (Table 2), and so has the cystogram, as depicted in our first case in Figure 1. Within a month after the operation, patients were generally rendered dry for 2 to 3 hours between catheterizations and could void to completion by Valsalva and credÈ maneuvers (Fig. 1D) although advised not to. The diaper rash and maceration caused by incontinence resolved, and nearly perfect fecal continence resulted with an antegrade enema every 1 to 3 days (Fig. 2).

We confronted two complications. First, an apparent leak from the ileal anastomosis occurred in our second patient on the 2nd and 3rd postoperative day. This was found to be caused by the tip of the urethral catheter traversing overlying suture lines of the patch and intestinal anastomosis and resolved rapidly with the Foley catheter was replaced and bowel rest and parenteral nutrition were extended for an extra few days. Second, in our fifth patient, the initially short retrocecal appendix later developed stenosis and had to be replaced by a tubed cecal flap through a McBurney incision some 2 months after the laparoscopic procedure. This patient performs catheterization for antegrade enema through the revised port with no difficulty or soiling at the port site.

Table 2. Representative Intraoperative and Postoperative Findings

Patient	*Follow-up (mos)*	*Approx. op time (min)*	*Intestinal anastomosis layers*	*Hospital stay (days)*	*Upper tract*[a]	*Reflux*	*Functional bladder capacity (mL)*	*Max. detrusor pressure (cm H_2O)*	*Valsalva leak-point pressure (cm H_2O)*	*Urinary continence on CIC q3H*
1	16	500	2	7	WNL	None	282	8	23	Dry
2	15	305	1	16	WNL	None	235	18	51	Dry
3	15	285	1	5	RK WNL LK scarred	None	331	12	29	Dry
4	14	285	1	5	WNL	None	301	17	52	Dry
5	13	300	1	5	WNL	None	207	10	39	Dry
6	13	280	1	5	WNL	None	204	9	23	Dry
Mean (range)	14 (13–16)	326 (280–500)		7 (5–16)			260 (204–331)	12 (8–18)	36 (23–52)	

[a]WNL = within normal limits; CIC = clean intermittent catheterization.

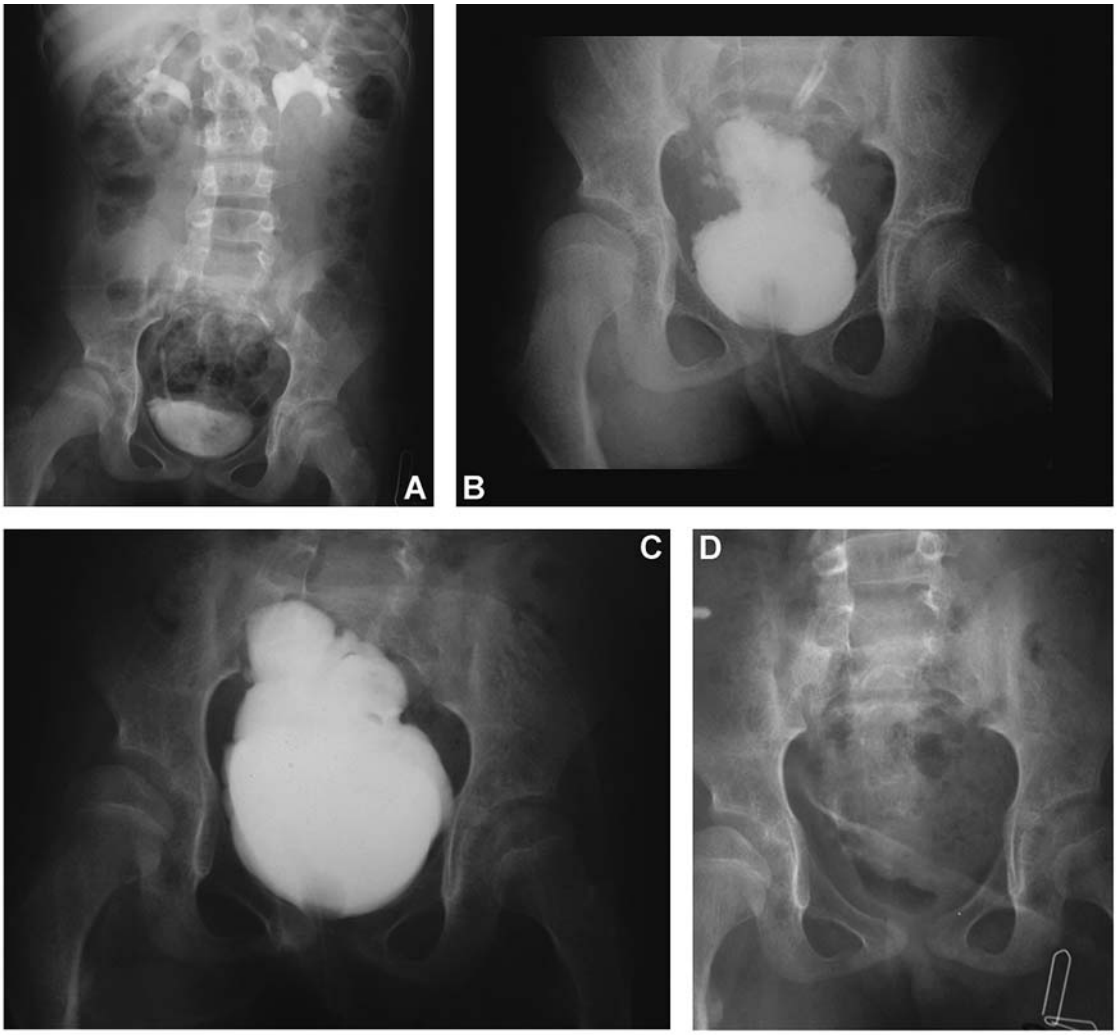

FIG. 1. Case 1. (**A**) Preoperative contrast urography. (**B**) Cystogram 3 weeks after laparoscopic ileal cystoplasty shows no leak. (**C**) Cystogram 2.5 months postoperatively at 220 mL. (**D**) No residual urine after voiding by credÈ and Valsalva maneuvers; note large spinal defect.

DISCUSSION

Elliot and colleagues[4] have described the preoperative workup, indications, and contraindications of laparoscopic ileocystoplasty. Apart from its cosmetic advantage, the shorter hospitalization time, decreased incisional pain, and earlier recovery of bowel function support this method of bladder augmentation. This represents our first series of totally laparoscopic ileocystoplasties with the Malone procedure incorporated. As such, it is distinct in the current literature for addressing all evacuation problems caused by spinal dysrhaphism at one session.

Our suturing time seems reasonable compared with open sutured precedents.[2] There were two complications as described, one at the intestinal anastomosis, treated conservatively, and the other at the appendix, necessitating local revision. Our second patient, in whom we confronted the anastomotic complication, had an exceptionally short and relatively thick mesentery. Reviewing the video from that procedure, in retrospect, we could see how the completed ileoileal anastomosis lay adjacent to the posterior vesicoenteric suture line. This probably encouraged the tip of the urethral catheter to find its way across these boundaries early postoperatively. The condition resolved in due time with conservative management; however, our obsessive stance at this early stage of experience drove us to keep

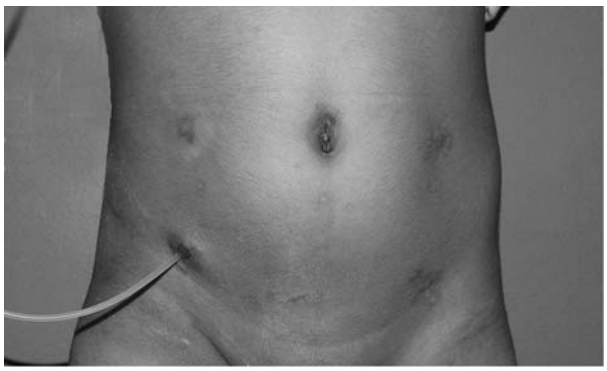

FIG. 2. Antegrade continence enema through appendix. Skin rash has resolved (case 1).

the patient under close observation for more than 2 weeks. We tried to observe the lesson learned from this patient to avoid such a complication in ensuing cases.

Use of a gastrointestinal stapling device for anastomosis could have simplified the bowel transection and anastomosis, albeit at a significantly greater cost with no guarantee against complications. This was proven by anastomotic fistulae arising in both cases of bladder augmentation reviewed by Vallancien et al.[5] The apparatus originally developed to aid endocorporeal suturing in laparoscopic pyeloplasty could probably be helpful in this procedure too, although the very long edges to be sewn would still demand a new suture to be introduced for every few centimeters to avoid the common trouble of entanglement.

The possibility of injuring the intramural ureters is minimal, obviating prophylactic stenting as long as one stops the sagittal bladder incision at least 1.5 cm from the interureteral ridge. Other predictable complications of this procedure are ubiquitous to all laparoscopic interventions and include inadvertent electrical injury of the bowel and anesthetic complications with a more lengthy operation.

In addition to the vast experience in open bladder augmentation, we had already accumulated extensive experience in reconstructive and ablative laparoscopy over the past years before embarking on laparoscopic enterocystoplasty. Intracorporeal freehand suturing and knot-tying are probably the latest skills to develop in a laparoscopic apprentice. Our suturing times decreased by some 25% over this series, but it is hard to conceive how the overall operation time could be significantly shortened to <5 hours, especially when pediatric patients are involved. Laparoscopy *per se* is perfectly suited to pediatric urology, and there is no clearcut ***age*** threshold below which children should not undergo this procedure. However, in our opinion, freehand suturing of such scale demands a minimum amount of work space. In our hands, this has meant a transverse inner diameter of the lower abdomen of ≥ 18 cm.

This series has clearly proven the efficacy of simultaneous laparoscopic bladder augmentation and antegrade continence enema in controlling all evacuation symptoms in children with myelomeningocele. However, this is a demanding procedure unlikely to be practiced widely unless a robotic interface can at least help to overcome the ergonomic burden of such protracted laparoscopic procedures.

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